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In the United States Patent and Trademark Office

Application Number:	10/692,755
Applicant:	DR. RUSI TALEYARKHAN
Examiner:	DR. RICARDO PALABRICA
Art Unit:	3663

February 27, 2009

FILING OF THE APPEAL BRIEF

VIA FAX 571 273 8300
Assistant Commissioner of Patents
Washington, DC 20231

Sir,

The appeal brief for the Appeal to the Board of Appeals for the above application is attached and contains 76 pages.

Very respectfully,

Dr. Arjuna I. Rajasingham
Chairman & Chief Executive
MMILLENNIUMM ENERGY CORPORATION

Att:
Appeal Brief 76 pages

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Applicant: Rusi Taleyarkhan

Application number: 10/692,755

Filing Date: 10/27/2003

Title of Invention: Methods and Apparatus to induce D-D and D-T reactions

Examiner: Rick Palabrica

Art Unit: 3663

Title: APPEAL BRIEF

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(B) Table of Contents page(s);

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(C) Real party in interest page(s);

MMILLENNIUMM ENERGY CORPORATION

MMILLENNIUMM GROUP INC.

DR. RUSI TALEYARKHAN

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(D) Related appeals and interferences page(s);

NONE

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(E) Status of claims page(s);

Claims:

1.(Withdrawn).

2.(Withdrawn)

3. (Withdrawn)

4. (Withdrawn)

5.(Withdrawn

6.(Withdrawn)

7.(Withdrawn)

8.(Withdrawn)

9. (Withdrawn)

10.(Withdrawn)

11.(Withdrawn)

12 .(Withdrawn)

13. (Withdrawn)

14. (Withdrawn)

15. (Withdrawn)

16.(Withdrawn)

17.(Withdrawn)

18. (Withdrawn)

19. (Withdrawn)

20.(Withdrawn)

21. (Withdrawn)

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22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Withdrawn)

27. (Cancelled)

28. (Cancelled)

29. (Cancelled)

30 (Cancelled)

31 (Cancelled)

32 (Cancelled)

33 (Cancelled)

34. (Rejected)

35. (Rejected)

36. (Rejected)

37. (Rejected)

38. (Rejected)

39. (Rejected)

40. (Rejected)

41. (Rejected)

42. (Rejected)

43. (Rejected)

44. (Rejected)

45. (Rejected)

46. (Rejected)

47. (Rejected)

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(F) Status of amendments page(s);

The applicant filed an amendment to claims 34 and 47, to correct the inadequate antecedent between claim 34 and Claim 44, and to conform to an elected species (Method) in claim 47. Claim 48, was added to address the comments by the examiner with regard to an optional step in the claimed methods of the invention. A grammatical error in claim 34 was also corrected.

The applicant understands that the amendments will not be entered.

Affidavits filed were not acknowledged by the Office. New Affidavit has been filed.

34. (Currently amended). A method for producing thermonuclear nuclear fusion, comprising the steps of: providing a working liquid enriched with <u>molecules comprising</u> isotopic D or T atoms ~~comprising molecules~~; placing at least a portion of said liquid into a tension state, a maximum tension in said tension state being below the cavitation threshold of said liquid, said tension state imparting stored mechanical energy into said liquid portion; directing <u>fundamental particles</u> ~~nucleating agents comprising at least one of: neutrons, photons, alpha particles and fission products~~, at said liquid portion when said liquid portion is in said tension state, said nucleating agents having sufficient energy for nucleating a plurality of bubbles substantially filled with vapor from said liquid, said bubbles substantially filled with vapor having an as nucleated bubble radius greater than a critical bubble radius of said liquid; growing said bubbles; and imploding said bubbles substantially filled with vapor, wherein a resulting temperature obtained from energy released from said implosion is sufficient to induce a nuclear fusion reaction of said isotopic D or T atom comprising molecules in said liquid portion.

47. (currently amended) <u>A method</u> ~~An apparatus~~ for producing thermonuclear fusion, comprising <u>the steps of : filling</u> a chamber <u>with</u> ~~containing~~ a high accommodation coefficient liquid; ~~a means for~~ inducing tension in said high accommodation coefficient liquid; <u>directing</u> a nucleating agent comprising at least one of: neutrons, alpha particles, photons and fission products to said chamber; ~~a means for~~ enhancing the size of the nucleated bubbles in tension

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to a volume greater than a predetermined volume before inducing controlled implosion; thereby producing thermonuclear fusion.

48. (new) A method of claim 34, wherein the working liquid is de-gassed prior to being put in a tension state.

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(G) Summary of claimed subject matter page(s);

Note: The appellant submits that the responses are given in relation to the July 23, 2005 Published Application by paragraph. The line numbers quoted are in relation to the noted paragraphs.

Claim 34.

A method to produce thermo-nuclear fusion in the local environment of vapor bubbles in the body of their parent liquid.

Comprising the steps of:

Step1.

> *"providing a working liquid enriched with molecules comprising isotopic D or T atoms"*

Figure 1 (item 124)

Para. 22 (line 12); Para. 73 (lines 2-3); Para. 76 (lines 2, 3, 8)

Step2.

> *"placing at least a portion of said liquid into a tension state, a maximum tension in said tension state being below the cavitation threshold of said liquid, said tension state imparting stored mechanical energy into said liquid portion"*

Para.15 (lines 3-6); Para.18 (lines: 2-5); Para. 26 (lines 3-7); Para. 178 (lines 1-3).

Step3.

> *"directing fundamental particles , at said liquid portion when said liquid portion is in said tension state, said nucleating agents having sufficient energy for nucleating a plurality of bubbles substantially filled with vapor from said liquid,*

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said bubbles substantially filled with vapor having an as nucleated bubble radius greater than a critical bubble radius of said liquid"

Fig.1 (item 150); Fig. 3c; Fig. 6 (item 633)

Para. 15 (lines 8-11); Para. 18 (lines 6-8); Para 21 (lines 1-2); Para. 55 (lines 3-4); Para. 129, Para. 132 (lines 3-7); Para. 166 (lines 1-3); Para 71; Para 176 (1-3).

Step4.

"growing said bubbles"

Fig. 3c

Para 15 (lines 9-11); Para 26 (lines 8-9); Para 33; Para 57 (lines 3, 8-9); Para 58 (lines 1-2); Para 63 (lines 3-5); Para. 64.

Step5.

"imploding said bubbles substantially filled with vapor, wherein a resulting temperature obtained from energy released from said implosion is sufficient to induce a nuclear fusion reaction of said isotopic D or T atom comprising molecules in said liquid portion"

Para 15 (13-17), para 18 (lines 8-11), para 26 (lines 11-14), para 28 (lines 8-11)

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Claim 47.

Step1.

"filling a chamber with a high accommodation coefficient liquid"

Fig. 1 (item 124)

Para 66, Para 74, Para 107 (1-4)

Step2.

"inducing tension in said high accommodation coefficient liquid"

Para 15 (3-6), Para 18 (2-5), Para 178 (1-3), Para 74, Para 190.

Step3.

"directing a nucleating agent comprising at least one of: neutrons, alpha particles, photons and fission products to said chamber "

Fig.1 (item 150); Fig. 3c; Fig. 6 (item 633)

Para. 15 (lines 8-11); Para. 18 (lines 6-8); Para 21 (lines 1-2); Para. 55 (lines 3-4); Para. 129, Para 130 (1-4), Para. 132 (lines 1-3); Para 157 (1-4), Para. 166 (lines 1-3); Para 71; Para 176 (2-3).

Step4.

"enhancing the size of the nucleated bubbles in tension to a volume greater than a predetermined volume before inducing controlled implosion"

Fig. 3a, Fig. 3c

Para 64, Para 67, Para 72 (lines 8-15), Para 120, Para 133.

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(H) Grounds of rejection to be reviewed on appeal page(s);

1. Whether claims 34 -46 are unpatentable under 35 U.S.C. 101 for lack of utility

2. Whether claims 34 -46 are unpatentable under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

3. In claim 34 "placing at least a portion of said liquid into a tension state, a maximum tension in said tension state being below the cavitation threshold of said liquid." , whether there is adequate description or enabling disclosure as to how and in what manner one can determine: a) that a portion of the liquid is in the so-called tension state; b) the maximum tension in a portion of the liquid in a tension state; and c) that the maximum tension is below the cavitation threshold of the liquid.

4. In Claim 34 "imploding said bubbles substantially filled with vapor." whether there is either an adequate description or enabling disclosure as to how and in what manner one: a) can determine when a bubble has been substantially filled with vapor; b)identify which of the bubbles that are allegedly substantially filled with vapor; and c) how many of these bubbles to implode to induce a nuclear fusion reaction.

5. In Claim 42 "synchronizing neutron impact with a location in said liquid having a predetermined liquid tension level." whether there is either an adequate description or enabling disclosure as to how and in what manner one: a) can determine the occurrence of an impact of the neutron with the pre-tensioned liquid; b) synchronizes the neutron impact with a location in said liquid; c) determines which specific location to direct the impact of the neutron.

6. In claim 34, whether the deletion of the degassing step is the addition of new matter.

7. In Claim 44, whether the recitation of "said fundamental particles" in lines 1 and 2 results in an insufficient antecedent basis for this claim.

8. In claim 46, whether the term "high accommodation coefficient liquid" is a relative term which renders the claim indefinite. As the term "high" which is not defined by the claim, and the specification does not provide a standard for ascertaining the requisite degree, whether

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one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

9. In claims 34, 35, 37-40, 44, 45, whether under 35 U.S.C. 102(b) are anticipated by Margulis (RU 2096934)

10. In claim 36, whether under 35 U.S.C. 102(b) are anticipated by Margulis (RU 2096934) with regard to heat exchangers.

11. In claims 42 whether under 35 U.S.C. 102(b) are anticipated by Margulis (RU 2096934)

12. In claims 34, 35, 37-40, 44, 45 whether under 35 U.S.C. 102(b) are anticipated by Lipson et ai., "Initiation of fusion reactions in media containing deuterium by cavitation," Soviet Physics: Technical Physics 37 (1992) .

13. In claims 36 whether under 35 U.S.C. 102(b) are anticipated by Lipson et ai., "Initiation of fusion reactions in media containing deuterium by cavitation," Soviet Physics: Technical Physics 37 (1992) .

14. In claims 42 whether under 35 U.S.C. 102(b) are anticipated by Lipson et ai., "Initiation of fusion reactions in media containing deuterium by cavitation," Soviet Physics: Technical Physics 37 (1992) .

15. Whether claim 41, is patentable over either Margulis or Lipson.

16. Whether claim 43 and 46, are patentable over either Margulis or Lipson, In light of Didenko et al.

17. Whether the duplicate claim 34 vs 44 can be overcome with the proposed amendment.

18. Whether Claim 47 is rejected as directed to a non-elected invention.

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(I) Argument page(s);

1. Whether claims 34 -46 are unpatentable under 35 U.S.C. 101 for lack of utility

The disclosure states that the invention produces excess neutrons and Tritium as the consequence of thermo-nuclear fusion. Affidavit from Xu. replicates this phenomenon in independent experiments.

References in disclosure:

1. Figs. 3e, 8, 10, 11, 12,13,14;

2. Para. 17;

3. para 24(line1);

4. para 58(line10);

5. para 94 (lines 7-8);

6. para 116(line1);

7. Para 121 (line 3);

8. Para 208;

9.Para 219;

10. Para 222;

11. Para 226;

12. Para 227.

The Utility of Tritium and neutron sources are well established in the background art but also noted in the disclosure in para 24 of the published application, and in Xu's affidavit (para. 8).

2. Whether claims 34 -46 are unpatentable under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

In general, the fusion of deuterium(D)-deuterium(D) atoms is unequivocally established in the literature (Gross, 1984) to lead to one of two almost equally probable nuclear reactions. These are:

- The production of a 1.01 MeV tritium (T) nucleus and a 3.02 MeV proton.
- The production of a 0.82 MeV helium-3 (^3He) nucleus and a 2.45 MeV neutron.

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For the thermonuclear bubble fusion system, the tell-tale signatures of the event involve the measurement of 2.45 MeV neutrons which must be time-correlated with the time of bubble implosion (i.e., when the conditions are compressed and hot and light flashes are generated), the generation of gamma photons commensurate with neutron interactions with structural atoms, together with the generation of T nuclei at rates that are similar in rate to that for neutron production.

The Appelant submits the following to establish probity and enablement.

I. In acoustic inertial confinement bubble nuclear fusion experiments (Taleyarkhan et al., 2002, 2004, 2006), all of which used the teachings of 10/692,755 for enablement, the evidence for D-D fusion includes the following key findings of fact:

1. A statistically significant (4 to 5 Standard Deviations) production of tritium nuclei [Science (2002) – Fig. 3; Phys.Rev.E (2004)-Fig.11];
2. A statististically significant (4 to 25 Standard Deviations) number of 2.45 MeV neutrons [Science(2002)-Fig.4; Phys.Rev.E (2004)-Fig.8; Phys.Rev.Ltr (2006)-Fig.4];
3. An approximately equal number of D-D neutrons and T nuclei produced during any given experiment [Science(2002); Phys.Rev.E (2004)];
4. The generation of D-D neutrons time correlated with sonoluminescence (SL) flashes during deuterated bubble cluster implosions [Science(2002)-Fig.5; Phys.Rev.E (2004)-Fig.7];
5. The subsequent (to neutron and SL) emission of statistically significant quantities of gamma rays due to D-D neutron capture in hydrogen and other atoms of surrounding structures and in the detector; the ratio of gammas to neutrons being about 0.05 to about 0.15, and the energy of the gamma rays being ~ 2 MeV as to be anticipated [Phys.Rev.E (2004)-Figs.9,10];
6. The attainment of null results (i.e., no neutron, gamma or tritium emissions) for corresponding control experiments under identical conditions but with the *only variation being change of the D atoms in test liquids to H atoms* [Science (2002), Phys.Rev.E (2004), Phys.Rev.Ltr (2006);
7. The consistency of the experimentally-observed results of neutrons and tritium with theory which, after considering all key physical phenomena associated with growth and implosion dynamics, reveal and predict conditions required for thermonuclear fusion (i.e., 1000+ GPa compression pressures and ~ 10^8 K plasma states) to occur only under the conditions of successful experiments. The same theoretical framework predicts non-attainment of such conditions for non-ideal thermal hydraulic conditions, as well as for low-accommodation coefficient fluids such as heavy water for similar experiment

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conditions – an aspect which is consistent with experimental findings, [Phys. Fluids (2005)-Fig.13, Science (2002)-Fig. 6];

8. The verification and confirmation of the neutron and tritium emission data by unaffiliated groups [Nucl.Engr.Design (2005); NURETH-11 (2005); Trans.Amer.Soc.(2006); Int.Fus.EnergyMtg.(2006); Bugg Report (2006); Public Demonstration Testomonials (2006)];
9. The consistency of neutron emission spectra from 5 separate reports with validated nuclear infrastructure methodologies utilizing state-of-art Monte-Carlo 3-D nuclear particle transport simulation tools (MCNP5 and SCINFUL) developed under U.S. DoE sponsorship at Los Alamos National Laboratory and Oak Ridge National Laboratory – as evidenced in Nucl. Engr. Des.(2008) – Figs. 6, 7, 9, 11]; and,
10. Testimonials of successful demonstrations on two separate occasions to collection of industry, government and academic bodies [IDI testimonials, 2006)].

II. Three affidavits confirming replications of the invention by three un-related and un-connected scientist, each of ordinary skill in the Art. These three Affidavits have been submitted and are of record (Please see Evidence appendix) .

The detailed Affidavit of Dr. Xu (para. 3) defines an independent replication of the invention enabled by the disclosures of 10/692,755, in a different location and organization with independently assembled apparatus.

III. The following evidence is further theoretical and experimental support for enablement of the invention. The examiner rejects this evidence as the results were published after the filing date.

A. Three independent academic papers defining the results obtained in replication experiments (corresponding to Affidavits of II. above) .

> Three independent replications of published sonofusion results (Nuclear Engineering and Design journal paper, Vol. 235, pp.1317-1324 by Xu et al., 2005; Archives of Trans. American Nuclear Society, Vol. 95, pp. 736-737, by Forringer et al., 2006; Le Tourneau University, Texas, Press Release, 2006; and the Bugg, W confirmation report dated June 9, 2006 to Purdue University of 2006) of the present invention. Proof of reproducibility and repeatability and confirmation of successful fusion signals attainment following the apparatus and operations of this 10/692,755 Application from published documents were reproduced for the examiner.

These are three successful replications of the invention as filed. These replications used the same methods and design of apparatus of the present invention. (Section II. presents affidavits

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of these successful replications). Therefore it provides *additional* clear probity for the present invention.

The appellant submits that nothing in the observable ambient universe that could affect this experiment is known to have changed between the date of filing and this duplicate experiment, and the replicators were of ordinary skill in the Art, and therefore the results provide *additional* clear probity for the invention.

B. The theoretical foundation for super-compression-induced thermonuclear fusion for the experimental conditions of the method used for the current application. This theoretical foundation takes into account all relevant physics and chemistry of the condition. It has passed worldwide peer reviews and validated by experts as being on sound theoretical foundations and published in the prestigious journal Physics of Fluids (Nigmatulin et al., 2005). This theoretical foundation when applied specifically to the method of the present invention confirms thermonuclear conditions (see Fig. 13 of the paper by Nigmatulin et al., 2005 – Physics of Fluids, Vol.17, 107106, 2005) with temperatures and pressures reaching in the range of 10^8K, and 1000+ Mbar, respectively – convincingly thermonuclear fusion conditions.

This is a theoretical foundation for super-compression-induced thermonuclear fusion for the experimental method and apparatus of the present invention. Published in a peer reviewed Journal. This theoretical result *by design* addresses the methods and apparatus of the present invention.

The appellant submits that the theoretical result by design considers the apparatus and method of the present invention and therefore the time of publication of the results do not affect the additional probity and enablement that this theoretical study provides.

C. Findings (Fig. 7c) in the premier journal Physical Review E, Vol. 69, 036109-1 to 11, by Taleyarkhan et al., 2004 that demonstrates experimentally that D-D fusion neutrons of 2.45 MeV in energy as required for thermonuclear fusion are emitted in a time –correlated manner with the emission of sonoluminescence (SL) light flashes demonstrating that the fusion reactions are occurring under hot, compressed conditions for the method and apparatus of this present invention application.

This is an experimental study reported in a reputable peer reviewed Journal that further supports enablement of the method and apparatus of the present invention for producing 2.45MeV neutrons required for nuclear fusion, in a correlated manner to the emission of sonoluminescense light flashes. The approach uses the *identical apparatus as noted in the invention* with the *exception of more sophisticated neutron detection approaches to get an even better statistically significant result*.

With regard to this support for probity and enablement, the examiner argues further, that D-D reactions were an non elected species and therefore this result is irrelevent. (The D-D reaction case was a non elected species with traverse) However, the Appellent submits that even if the examiner limits consideration to the elected part of the invention, a D-D reaction envelopes the conditions for a D-T reaction and provides for the record art that establishes factual

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experimental underpinnings. (reference: "Gross., R. A., 1984 "Fusion Energy" John Wiley & Sons.) Therefore, the applicant submits that the D-T reactions will occur if conditions for D-D reactions are provided as indicated in the Response of 2008-5-21 as experimental evidence of this reaction phenomenon.

Therefore in this result is further support of probity and enablement as nothing in the observable ambient universe that could affect this experiment is known to have changed between the date of filing and this duplicate experiment.

IV. Furthermore, the applicant has provided in the Appendix, yet another *additional* confirmation for the validity of the thermo-nuclear fusion results " Modeling Analysis and prediction of neutron emission spectra from acoustic cavitation bubble fusion experiments" Nuclear Engineering and Design 238 (2008, 2779-2791).

V. Moreover, further support is provided in the paper on theoretical foundations "The Analysis of Bubble Implosion Dynamics" Supplement #2 (Reference 25 in the IDS) and as published in Science: www. Sciencemag.org/cgi/content/full/295/5561/1868/DC1.

3. In claim 34 "placing at least a portion of said liquid into a tension state, a maximum tension in said tension state being below the cavitation threshold of said liquid." , whether there is adequate description or enabling disclosure as to how and in what manner one can determine: a) that a portion of the liquid is in the so-called tension state; b) the maximum tension in a portion of the liquid in a tension state; and c) that the maximum tension is below the cavitation threshold of the liquid.

The appellant respectfully submits that:

i. There exists a tension state for liquids achievable with tensile forces on the target volume of the liquids. For example even in nature mechanical motion of vascular passages of plants lead to liquid in tension. (Reference: Scholander., P. F., "Sap pressure in vascular plants" Science Volume 18, pp 339-345 16 April 1965.)

ii. Therefore a portion of the liquid may be reduced to the tensioned state by applying a tensile force to the container walls that is by design in contact with the liquid. Such a force may be effected by a mechanical device as in the present invention that may be centrifugal force or oscillations of the wall by an electro-mechanical device. Such force enabling by these two phenomena are well established in the background art. The magnitude of the noted force can be increased by design to ensure that the liquid is at a desired level of the tension state.

iii. The specification teaches the regions of the liquid that are in tension as a result of the apparatus design. For example originally filed Specification page 47 line 15-18 and Page 39 lines 19-21. (para [0135] and para [0167] as published).

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iv. There exists a cavitation threshold for such tensioned liquids by audible and visible inspection at adequate drive power of the mechanical force in the presence of nucleating particles.

v. The method or apparatus of the invention can achieve and exceed such a cavitation threshold *by design* as in 3.2 above, as a result of 3.3 above.

Therefore the appellant respectfully submits that the enablement requirement is met with the background art.

4. In Claim 34 "imploding said bubbles substantially filled with vapor." whether there is either an adequate description or enabling disclosure as to how and in what manner one: a) can determine when a bubble has been substantially filled with vapor; b)identify which of the bubbles that are allegedly substantially filled with vapor; and c) how many of these bubbles to implode to induce a nuclear fusion reaction.

The appellant respectfully submits that:

i. The background Art is replete with exposition that any fluid will exert a vapor pressure in an adjoining space and therefore such bubbles are substantially filled with vapor of the parent liquid as disclosed. As there are no other liquids in contact with the bubble surface therefore there is no other vapor pressure exerted. Moreover, considering that there is no attempt to intentionally dissolve gases in the parent liquid the resulting partial pressures if any such gases are small, however as the parent liquid at some point may have had a surface open to a gas such as the constituent gases of the atmosphere, there is likely to be some – even minute quantities -- of preexisting dissolved gas in the parent fluid. Therefore the applicant submits that all such bubbles are substantially filled with vapor of the parent liquid.

ii. One or more such imploding bubbles create nuclear fusion as substantiated in the experimental observation results of the disclosure. The nature of bubbles that create nuclear fusion are defined in the Specification Page 18 lines 20-21 page 19 lines 1-4.

Therefore the appellant respectfully submits that the disclosure in conjunction with the background art is enabling.

5. In Claim 42 "synchronizing neutron impact with a location in said liquid having a predetermined liquid tension level." whether there is either an adequate description or enabling disclosure as to how and in what manner one: a) can determine the occurrence of an impact of the neutron with the pre-tensioned liquid; b) synchronizes the neutron impact with a location in said liquid; c) determines which specific location to direct the impact of the neutron.

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The appellant respectfully submits that the specification discloses the production of tensioning of the liquid in synchronization with the nucleating particles. Fig 3, Page 21 lines 8-15, Page 25 lines 3-20, of the original Specification.

The nucleating particles are directed in the direction of the chamber and therefore those that reach the liquid during the above tension state are capable of nucleating 10-100nm size bubbles. It is established in the background art that nucleating particles can nucleate bubbles of this size in meta-stable liquids. Reference: Glaser. D. A., Phys. Rev., Vol.87, 665, 1952.

Therefore the appellant respectfully submits that the disclosure in conjunction with the background art is enabling.

6. In claim 34, whether the deletion of the degassing step is the addition of new matter.

The examiner rejects claims 34-46 as he notes that on claim 34, as amended: applicant has deleted the step, "degassing said liquid to reduce a dissolved gas content therein, wherein said dissolved gas is removed using an applied vacuum." Note the following passages in the specification that demonstrate criticality of the degassing step in the exercise of the claimed invention:

"To minimize the effect of gas cushioning during implosive collapse, the working liquid can be degassed, a *priori. Alternatively* or *in combination,* a *sufficient vacuum state above the working liquid accompanied by induction of gaseous cavitation induced by nuclear particles such as neutrons* or *via use of lasers* or *acoustic horns can be used to reduce the dissolved gas content in the working liquid to limit unwanted gas cushioning." See page* 17, last *paragraph.*

Following degassing of the working liquid, the liquid is tensioned and nucleation of vapor cavities followed by implosion of the same can be initiated. Tensioning the liquid can be provided by a *variety of methods, including an acoustical wave source, an electrostrictive (piezoelectric) source,* a *magnetostrictive source,* a *centrifugal source,* a *focused (pulsed) acoustic energy* or a *venturi based system. Preferably, when an acoustical wave source is used, the acoustical wave source includes an acoustical focusing device, such as* a *parabolic-type reflector* or a *resonant cavity to intensify the acoustic pressure. See page* 17, *last paragraph.*

The appellent respectfully submits that the degassing step is an <u>*optional*</u> step to enhance the operation of the method or apparatus even as stated in the above by the examiner:

> "To minimize the effect of gas cushioning during implosive collapse, the working liquid <u>*can*</u> be degassed, a priori." (emphasis provided)

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For example there is no need to de-gass a liquid that is already substantially free of gas.

The applicant therefore respectfully submits that the claim as amended is consistent with the original disclosure which is enabling.

7. In Claim 44, whether the recitation of "said fundamental particles" in lines 1 and 2 results in an insufficient antecedent basis for this claim.

The appellant has amended the claim to be consistent and submits that as amended it is now with claim 34.

8. In claim 46, whether the term "high accommodation coefficient liquid" is a relative term which renders the claim indefinite. As the term "high" which is not defined by the claim, and the specification does not provide a standard for ascertaining the requisite degree, whether one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The appellent respectfully submits that the specification makes clear what high and low mean. High accommodation coefficient is stated to be ~1.0 (the maximum) the value associated with organic liquids such as acetone, benzene, tetrachloroethylene whereas, low is stated to be closer to 0 citing the value for water at ~ 0.07 which is not recommended for enhanced fusion induction capability. See for example Specification as filed for experimental results page 16 lines 8-20 and validating theoretical foundations Page 70 lines 14-20, Page71 lines 1-8.

Moreover, the background art has definitions for high accommodation liquids accessible to those with ordinary skill in the art for example. Reference 25 in the IDS of 2003 .

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Comparison -Margulis and Lipson with the present invention 10/692,755 for 102/103 rejections